Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_

**Liver Enzyme Lab**

Ms. Ottolini, AP Biology

**Background Information:**

Liver and other living tissues contain the enzyme catalase. This enzyme breaks down hydrogen peroxide, which is a harmful by-product of the process of cellular respiration if it builds up in concentration in the cells. If we use liver or other tissue containing this enzyme, we can measure the effect of varying temperature and pH on enzyme activity. The reaction for the break-down of hydrogen peroxide (by catalase) into water and oxygen gas is given below.

2H2O2 🡪 2H2O + O2

**Your Hypothesis:**

-***pH:*** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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***-Temperature:*** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Materials:**

|  |  |
| --- | --- |
| 6 Test tubes and rack Test tube “tongs”  Thermometer Stirring rod pH paper  10-ml Graduated cylinder 2 beakers for water baths | Ruler  Hot plate  1 molar HCl solution (in dropper bottle) 1 molar NaOH solution (in dropper bottle)  40 ml 3% Hydrogen peroxide solution Beef liver |

**Procedure**

***Temperature***

1) Measure 1 mL of hydrogen peroxide and pour into a small test tube. Take the temperature (room temperature) in degrees Celsius of the hydrogen peroxide and record. Place a small piece of liver (approximately one cm square), and measure the change in height of the bubbles produced. Measure from the liquid line to the top of the dense section of bubbles. (ASK YOUR TEACHER WHAT THIS MEANS!)

2) Create a hot water bath in a beaker on a hot plate. This hot water bath SHOULD NOT be boiling and should be at approximately 37 degrees Celsius. Place a tube with liver and a tube with 1 mL of hydrogen peroxide into the water bath for 3 minutes, and take the temperature of the water bath. Remove the liver and hydrogen peroxide tubes from the water bath and pour the hydrogen peroxide into the liver tube. Measure the change in height of the bubbles produced.

3) Create a cold water bath with ice and water in a beaker. Place a tube with liver and a tube with 1 mL of hydrogen peroxide into the water bath for 3 minutes, and take the temperature of the water bath. Remove the liver and hydrogen peroxide tubes from the water bath and pour the hydrogen peroxide into the liver tube. Measure the change in height of the bubbles produced.

***pH***

1) Add 2 ml hydrogen peroxide to each of 3 clean test tubes. Treat each tube as follows:

Tube 1--add 1 drop of 1molar HCl (acid) and record the pH.

Tube 2--add 5 drops of 1 molar NaOH (base) and record the pH.

Tube 3—record the pH of plain hydrogen peroxide.

CAUTION: Do not let acids or bases contact your skin or clothing. Swirl each test tube after adding each drop and measure the pH of each solution with pH paper. To do this, remove a drop or two of solution from a test tube using a clean glass stirring rod. Rinse your stirring rod and wipe dry before you dip it into each test tube. Place the drop on pH paper. Record the pH of each solution.

2) Next, add a small piece of liver to each test tube. Measure the change in height of the bubbles produced.

**Methods Summary Chart:**

|  |  |
| --- | --- |
| Independent Variable |  |
| Levels of the Independent Variable (if applicable) |  |
| Dependent Variable |  |
| Method for Measuring Changes in the Dependent Variable |  |
| Control Group (if applicable) |  |
| Constants (factors that stay the same between your control group and your experimental groups) |  |
| Number of Trials |  |

**Data Tables (Individual Lab Group)**

**Data Tables (Class)**

**Discussion / Conclusion Questions:**

1. Describe any trends in the data.
2. Does the data support or refute the hypotheses?